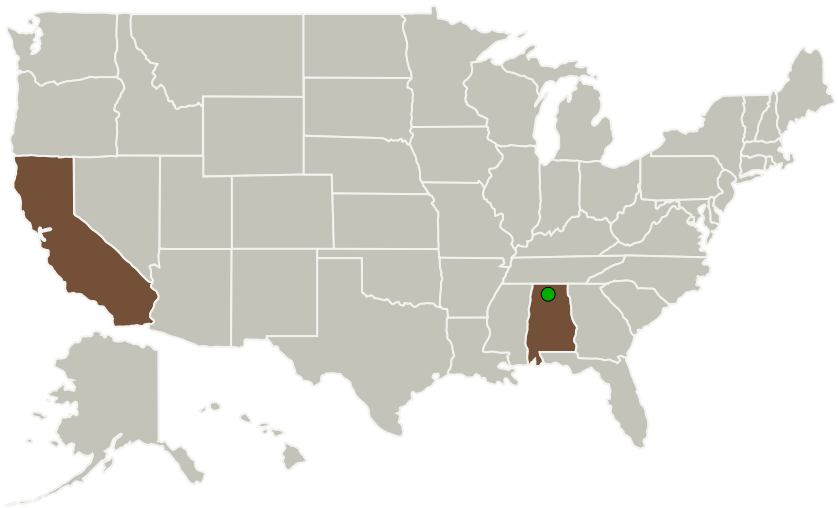
Pre-Collimator Chemical Milling for X-ray Telescopes, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Combining Chemical Milling with wire Electrical Discharge Machining (EDM), Mindrum Precision will build a precollimator (PC) faster and more cost effective than current methods. Space-based x-ray telescopes currently involve the use of a PC to shield the optics from stray light. Each PC requires extensive build time from highly skilled technicians. The PC cylindrical aluminum ribs (or blades) are individually attached to alignment frames. This hands-on "place/weld/measure and repeat" process is ineffective for the thousands of ribs. Build times have exceeded a year, and sometimes the PC still failed to perform. Some telescopes scrap the PC early to avoid these complications and accept the limitations in performance. Eliminating the hands-on time with CNC unattended wire EDM automates the build, but can't reach the thin walls required. Chemical milling of this large, complex structure is an innovation which will bring fast and affordable PC to market. Current chemical milling uses HF and HNO3 acids to etch thin films of Titanium. However, etching is traditionally done on thin sheets. Mindrum Precision process will investigate etching of this complex material. New concentration levels, etch times, and agitation methods will be explored to achieve a uniform etch along the entire length of the numerous 3" slots. Mindrum Precision will combine wire EDM with Chemical Milling to rapidly make affordable precollimators for future telescopes.

Primary U.S. Work Locations and Key Partners



Pre-collimator Chemical Milling for X-ray Telescopes, Phase I Briefing Chart Image

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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Mindrum Precision, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Rancho Cucamonga, California
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	California

Project Transitions

June 2017: Project Start

December 2017: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140771)*

Images

Briefing Chart Image
Pre-collimator Chemical Milling for X-ray Telescopes, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/128999)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Mindrum Precision, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

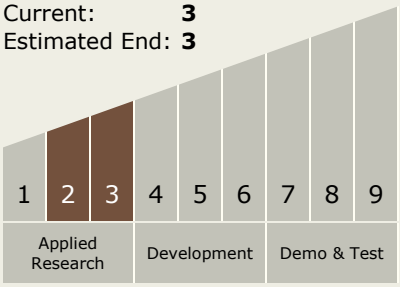
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Anthony J Pinder

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System